REMARKS

Claims 19 – 31 and new claims 34 - 47 are pending in the case. The previously filed amendment had an error in claim numbering, in particular having new independent claim 32, followed dependent claims 32 and 33. These claims are canceled and are re-written as new claims 40 - 42.

SUBSTANCE OF THE INTERVIEW

Applicant appreciates Examiner Marcheschi's time and attention during an interview on June 28, 2007. During the interview the independent claims and claim 21 were discussed, where the undersigned argued that while high rate was not numerically defined in the specification, such numerical definition was not necessary if the bounds would be understood by one of ordinary skill in the art, and further the fact that the examples showed rates of 3707 and 3983 angstroms per minute was conclusive evidence that the phrase "high rate" as it pertains to dielectric removal encompasses rates of 3707 and 3983 angstroms per minute, as well as rates above 3707 and 3983 angstroms per minute.

REJECTIONS OVER 35 U.S.C. 112

The Examiner asserted that the phrase "high rate" in independent claim 19 is indefinite. The Examiner states that "high rate" is indefinite because neither the claim nor the specification provide a standard for "high," and therefore one of ordinary skill in the art would not be apprised of the scope of the invention. Additionally, claim 21 is rejected because the Examiner asserts claim 21 is invalid as not being enabled, as claim 21 recites a removal rate for a composition, but "the specification only teaches the use of specific components in the slurry to provide the claimed removal rate (and therefore) such a limited disclosure does not support the breath of the instant claim."

Applicants respectfully traverse. Literal support for the phrase "high removal rate of dielectric material" can be found in paragraph [0018].

> This invention provides a composition and an associated method that are useful for chemical mechanical planarization ... and which afford low levels of defectivity, haze, and scratching while simultaneously afford high removal rates of dielectric material during CMP processing of substrates comprised of dielectric material in fabricating semiconductor chips/devices.

The specification provides no numerical lower limit on what is a high oxide rate, and of course no upper limit is needed for such a phrase. However, examples 1 and 2 in the specification were examples of high rate oxide polishing and they demonstrated oxide removal rates of 3707 and 3983 angstroms per minute. With respect to new claims 38, 43, 44, 45, and 47, Example 2 is an (the) example of the invention, the invention is defined as polishing at a high rate, and therefore a dielectric material removal rate of 3983 angstroms per minute falls within the phrase "high rate" as applicant defined the invention. If the invention is defined as polishing at "high rate" and 3983 angstroms per minute falls within this "high rate" limitation, then one of ordinary skill in the art understand that the specification teaches and supports the claim limitation "the removal rate of the dielectric material is at least 3983 angstroms per minute"

Further, with respect to claim 21, the comparative example shows high rate oxide polishing but does not "afford low levels of defectivity, haze, and scratching" as taught in paragraph [0018] reproduced above. However, the oxide removal rate of 3707 angstroms per minute is high rate oxide polishing, as would be readily understood by one of ordinary skill in the art.

Further, Applicants maintain that one of ordinary skill in the art would know and understand the scope of the phrase "high rate" as it applies to oxide polishing at the time the application was filed. Examples 1 and 2 in the specification are examples of what is meant by the term "high rate." Applicant considers high rate oxide polishing to be a rate greater than 3000 angstroms per minute. For example, the Examiner is directed to co-owned patent US 5981205 (which issued in 1999) where comparative Example 1 shows traditional oxide polishing with 15% silica gave an oxide removal rate "leveling out at about 1600 angstroms/min," while Example 2 (having ceria added thereto) provided oxide removal rates of 5000 angstroms per minute at 9 psi (Figure 4 samples 1-22) and just over 4000 angstroms per minute at 7 psi. The Examiner is also directed to US 6491843 shows a number of examples of oxide polishing at rates above 400 nm/minute (4000 angstroms/minute). US 5759917 (filed in 1996) stated "this invention is a CMP slurry having a unique chemistry that is especially suitable for chemical mechanical planarization where a high silicon dioxide removal rate, and a low silicon nitride removal rate are required on the same substrate," where examples showed removal rates of 1600

to 2900 angstroms per minute (which was high at that time). The Examiner is cautioned that a high silicon dioxide removal rate is no guarantee of a high silicon oxide removal rate.

The Examiner also rejected claims 19 and 32 because the limitation "providing a substrate having a surface and a polishing pad" could be misconstrued. The amendments to claim 19 and to claim 32 (now re-written as claim 40) are believed to make this rejection moot.

In view of the arguments and amendments, Applicant requests removal if the 35 USC 112 rejections of claims 19, 21, and 32 (now re-written as claim 40).

The Examiner also rejected claim 22, stating while the specification enables a fluoride salt amount of 0.005, it did not enable a fluoride salt in an amount of about 0.004%. While the specification did state in paragraph [0021] of the published application "the level of fluoride salt according to this invention is relatively low and typically will be in the range from about 0.005 weight percent up to about 0.1 weight percent," the only Example had 9 grams of a 5% ammonium fluoride solution in 12010 grams of slurry, which comes to about 0.0037 percent ammonium fluoride. The term "about 0.004%" need not be literally supported, and Applicant believes the text saying the amount is relatively low and is typically about 0.005% to 0.%, where the example had a calculated amount of about 0.0037%, would teach to one of ordinary skill in the art that the amount can be about 0.004%. Using one significant digit in the claim is proper. Use of more than one significant digit (as in about 0.0037%) is not proper because only a single significant digit was provided for the amount of ammonium fluoride solution added (9 grams) and only a single significant digit was provided for the amount of ammonium fluoride in the added solution (5%), and these values were used to calculate the ~ 0.0037% that was in the example. An ammonium fluoride concentration of about 0.004% is a proper description of the composition of example 2. Applicant therefore requests removal of the 35 USC 112 rejections of claims 22.

The Examiner also rejected claim 23 as it contained a typographical error, and this rejection is believed moot in light of the amendment thereto.

REJECTION OVER STREINZ/ MOEGGENBORG

With respect to claim 32: Claim 32 (now re-written as claim 40) stands rejected as obvious over Streinz in view of Moeggenborg. The Examiner uses Streinz to teach a composition containing an abrasive, a fluoride salt, and a surfactant, and uses Moeggenborg to supply motivation and knowledge of using Surfynol 104 from Moeggenborg. Moeggenborg mentions the claimed Surfynol 104, but only in Example 4 at concentrations of 0.1% or 0.02% Surfynol 104 (the text conflicts with the Table 4). Applicants respectfully traverse.

Claim 40 is a method reciting polishing a dielectric material with a composition consisting essentially of a silica abrasive; a fluoride salt; an acetylenic alcohol comprising at least two hydroxyl substituents; and water. Metal CMP formulations, including those of Streinz, contain a significant amount of oxidizers. Streinz teaches a polishing composition to remove titanium and tungsten (metals) from a substrate. Streinz's composition has an abrasive, a fluoride salt, optionally a surfactant, and periodic acid, where the surfactant can be can be anionic, cationic, nonionic, and/or amphoteric. *See* Streinz at column 8 lines 4-9, and at column 7 lines 59-61. Periodic acid is an oxidizer. The composition of claim 40 is used in a method to polish dielectric material, and uses the phrase "consisting essentially of." "Consisting essentially of" clearly excludes the oxidizers taught by Streinz. The oxidizers (and myriad other components) of Strienz clearly change the basic nature of the composition (making the composition useful for polishing metal but not useful for polishing dielectric material). Streinz in column 3 lines 26-33 says:

> The chemical mechanical polishing slurry of this invention has been found to have a high titanium (Ti) polishing rate as well as a high tungsten (W) and titanium nitride (TiN) polishing rates. In addition, the chemical mechanical polishing slurry exhibits desirable low polishing rates towards the dielectric insulating layer.

Applicants note that while the Examiner on page 12 of the Office Action dropped the Streinz reference with respect to claim 19, the Examiner maintains the rejection of Streinz with respect to claim 32 (now rewritten as claim 40) because claim 32 does not mention a polishing rate. The Examiner opines Streinz obviates claim 32 because the additional components of Streinz would not affect the basic and novel characteristics of the claimed invention. The basic and novel characteristics of the method of claim 32

(now claim 40) are providing a composition that contains very low levels of a surfactant and polish dielectrics at useful rates with very low defects. The composition recited in claim 40 polish oxide at ~3900 angstroms per minute with very low defects. The examples of Streinz polished oxide at between 35 and 181 angstroms per minute, mand had a number of materials known to affect dielectrics. We can not see how the Examiner can state a 20 to 130 fold increase in such an important property does not affect basic and novel characteristics of the method.

Again, Applicants urge that the presence of an oxidizer in amounts taught by Streinz changes the basic nature of the composition and therefore does not make obvious claim 40 having the "consisting essentially of" language.

REJECTIONS OVER MISRA/ MOEGGENBORG

Claims 19-22, 25-30, and 32 (now rewritten as claim 40) stand rejected as obvious over Misra in view of Moeggenborg. The Examiner uses Misra to teach a composition containing an abrasive, a fluoride salt, and a surfactant, and uses Moeggenborg to supply an acetylenic alcohol comprising at least two hydroxyl substituents. Applicants respectfully traverse.

With respect to claim 19: Claim 19 recites a high dielectric material removal rate. The combination of Misra and Moeggenborg will not provide an oxide composition capable of polishing oxide at a high rate. There is no teaching or any suggestion of high oxide removal rates in Misra. Moeggenborg in Example 4 a composition having silica, an acetylenic alcohol comprising at least two hydroxyl substituents, and benzotriazole at pH of 8. However, Moeggenborg only teaches compositions having oxide CMP compositions exhibiting medium oxide removal rates -- the highest TEOS oxide removal rate reported in Moeggenborg was in Example 3 in Table 3 show oxide removal rates between 1164 and 1237 angstroms per minute. Moeggenborg did not provide an oxide removal rate in Example 4, but from Moeggenborg's similar examples we expect the oxide removal rate of Moeggenborg's Example 4 was below 1200 angstroms per minute. Moeggenborg's Example 4 showed the addition of the diol resulted in lowered oxide removal rate. Claim 19 recites a high oxide removal rate, and the disclosure of polishing rates of ~1200 angstroms per minute does not meet nor make obvious that limitation.

With respect to claims 21 and 34: Claim 21 recites the dielectric material is a silicon oxide and the removal rate of the silicon oxide is at least 3983 angstroms per minute. Claim 34 is similar in scope but more fully defines the silicon oxide. As described with respect to claim 19, the combination of Misra and Moeggenborg will not provide an oxide composition capable of polishing oxide at a high rate. The highest silicon oxide rate disclosed in Moeggenborg is ~1200 Angstroms per minute, which is well below the 3983 angstroms per minute recited in claim 21, and Misra does not disclose anything relating to removal rate. This combination of references therefore can not make obvious claim 21.

With respect to claim 22: Claim 22 recites the fluoride salt is present in an amount of about 0.004%. Moeggenborg does not teach use of fluoride. Misra in column 5 lines 37-40 teaches the fluoride "is typically present in an amount from about 0.1% to about 1.0%, preferably from about 0.3% to about 0.6%, more preferably from about 0.4%, by weight of the slurry composition." The Examiner opines the qualifier "about" in Misra allows some tolerance and therefore teaches the recited value. Applicants disagree. The minimum amount recited by Misra is 25 times the amount recited in claim 22! Misra teaches a high fluoride composition where fluoride is an etching agent to increase polishing rates. However, fluoride interacts with and damages dielectrics. The novel idea encompassed in claim 22 is high dielectric removal rates and low fluoride concentrations. This combination of references therefore can not make obvious claim 22.

With respect to claim 32 (now claim 40, as amended): Claim 40 recites the composition consists essentially of a) a silica abrasive; b) a fluoride salt; c) an acetylenic alcohol comprising at least two hydroxyl substituents; and d) water. Misra teaches compositions having abrasive particles, a suspension medium, a peroxygen compound, an etching agent, and an alkyl ammonium hydroxide to polish oxide. See Misra Abstract and also column 2 lines 54-65. Misra states "The slurry compositions of the present invention preferably include a surfactant which enhances the wettability of the surface being planarized and reduces vibrations caused by the CMP process. Suitable surfactants which can be used in the slurry compositions of the invention are known in the art and include, for example, Surfynol 440." However, Misra in column 5 lines 55-59 requires the composition contain 0.5% to 10% of alkyl ammonium hydroxide. The presence of

the alkyl ammonium hydroxide clearly affects the basic nature of the composition – the alkyl ammonium hydroxide is alternately described in column 5 lines 51-55 as an agent "believed to provide chemical action which facilitates the mechanical planarization of the material to be planarized." and in column 6 lines 10 – 12 "as a passivating agent ... (that) typically forms a thin, protective layer on the surface of the substrate." Applicants urge that the presence of the alkyl ammonium hydroxide in amounts taught by Misra change the basic nature of the composition and therefore does not make obvious claim 40 having the "consisting essentially of" language.

REJECTIONS OVER PASQUALONI/ MOEGGENBORG

Claims 19-22, 26-30, and 32 (now rewritten as claim 40) stand rejected as obvious over Pasqualoni in view of Moeggenborg. The Examiner allegedly uses Pasqualoni to teach a composition containing an abrasive, about 0.01% of a fluoride salt, and a surfactant, used to polish silicon oxide, and uses Moeggenborg to supply an acetylenic alcohol comprising at least two hydroxyl substituents. Applicants respectfully traverse.

With respect to claim 19: Claim 19 recites a high dielectric material removal rate. The combination of Pasqualoni and Moeggenborg will not provide an oxide composition capable of polishing oxide at a high rate. There is no teaching or any suggestion of high oxide removal rates in Pasqualoni. Moeggenborg in Example 4 a composition having silica, an acetylenic alcohol comprising at least two hydroxyl substituents, and benzotriazole at pH of 8. However, Moeggenborg only teaches compositions having oxide CMP compositions exhibiting medium oxide removal rates -- the highest TEOS oxide removal rate reported in Moeggenborg was in Example 3 in Table 3 show oxide removal rates between 1164 and 1237 angstroms per minute. Moeggenborg did not provide an oxide removal rate in Example 4, but from Moeggenborg's similar examples we expect the oxide removal rate of Moeggenborg's Example 4 was below 1200 angstroms per minute. Moeggenborg's Example 4 showed the addition of the diol resulted in lowered oxide removal rate. Pasqualoni has compositions that may be useful for removing silicon dioxide at less than 1400 angstroms per minute (see Figure 1 of Pasqualoni, where the "TOX" might be silicon dioxide removal rates.). There certainly is no suggestion in the text that Pasqualoni polishes at a

rate higher than 1400 angstroms per minute. Claim 19 recites a high oxide removal rate, and the disclosure of polishing rates of ~1200 angstroms per minute and less than 1400 angstroms per minute does not meet nor make obvious that limitation.

The Examiner mentioned on page 12 of the Office Action that while we argued Pasqualoni does not teach the high rate, a disclosure is not limited to its examples and if the composition is the same then the polishing rate would be the same. The Examiner's reasoning builds on two false premises, using each to "support" the other. The compositions of Pasqualoni are not the same as those disclosed herein, and Pasqualoni does not suggest any high rate of oxide polishing, and only his Examples might show an intermediate rate! Pasqualoni teaches in the Abstract that "the slurry is comprised primarily of abrasive particles and an oxidizing agent." There is no oxidizer in claim 19, nor is there any oxidizer in the example which shows the requisite high rate polishing. On the other hand, the composition of Pasqualoni is identical to the composition of Streinz, and Strienz also taught an oxidizer, and Strienz's oxide removal rate was very small. Pasqualoni teaches a fluoride salt, but in an amount between 2.5 times and 50 times the amount taught in the instant disclosure.

With respect to claims 21 and 34: Claim 21 recites the dielectric material is silicon oxide and the removal rate of the silicon oxide is at least 3983 angstroms per minute. Claim 34 is similar in scope but more fully defines the silicon oxide. Silicon oxide is known in the art as TEOS, from it's precursor chemical. Pasqualoni suggests his composition may polish silicon dioxide. Pasqualoni also mentions "silicon oxide" in the background paragraph bridging column 1 and column 2, and mentions TEOS in the background paragraph bridging column 2 and column 3, but Pasqualoni does not teach or suggest that his composition is useful for polishing silicon oxide or TEOS. Contrary to the Examiner's contention with respect to claim 26, an "oxide" or "silicon oxide" formed from for example TEOS does not have the same properties as silicon dioxide. However, Moeggenborg does teach polishing an oxide. More importantly, as described with respect to claim 19, the combination of Pasqualoni and Moeggenborg will not provide an oxide composition capable of polishing oxide at a high rate. The highest silicon oxide rate disclosed in Moeggenborg is ~1200 angstroms per minute, and Pasqualoni has compositions that may be useful for removing silicon dioxide at less than 1400 angstroms

per minute. Both are well below the 3983 angstroms per minute recited in claim 21. Nothing in the text suggests that the compositions of Moeggenborg nor Pasqualoni could approach this removal rate. This combination of references therefore can not make obvious claim 21.

With respect to claim 22: Claim 22 recites the fluoride salt is present in an amount of about 0.004%. Moeggenborg does not teach use of fluoride. Pasqualoni in column 5 lines 42-46 teaches "the fluorine-containing compounds may be present in the slurry composition in a concentration of about 0.01% to 5%, and are preferably present in a concentration of about 0.10% to 2% of the total weight of the slurry." The Examiner opines the qualifier "about" in Pasqualoni allows some tolerance and therefore teaches the recited value. Applicants disagree. The minimum amount recited in the large range in Pasqualoni is 250% of the maximum amount recited in claim 22! Pasqualoni teaches a higher fluoride composition. Fluoride interacts with and damages dielectrics. The novel idea encompassed in claim 22 is high dielectric removal rates and low fluoride concentrations. This combination of references therefore can not make obvious claim 22.

With respect to claim 32 (now claim 40, as amended): Claim 40 recites the composition consists essentially of a) a silica abrasive; b) a fluoride salt; c) an acetylenic alcohol comprising at least two hydroxyl substituents; and d) water. Pasqualoni teaches in the Abstract that "the slurry is comprised primarily of abrasive particles and an oxidizing agent." The presence of the oxidizing agent is expected, because as mentioned in Streinz above the composition of Pasqualoni is intended to polish a metal – copper. The oxidizer was present in Streinz (see argument above), and Streinz taught the composition having the oxide provided a low oxide polishing rate. Applicants urge that the presence of an oxidizer in amounts taught by Pasqualoni changes the basic nature of the composition and therefore does not make obvious claim 40 having the "consisting essentially of" language.

REJECTIONS OVER FANG/ MOEGGENBORG

Claims 19-24 and 26-34 (including claim 32 now rewritten as claim 40) stand rejected as obvious over Fang in view of Moeggenborg. The Examiner allegedly uses Fang to teach a composition containing an abrasive with 95% being colloidal, about a fluoride salt the Examiner urges can be present in any amount but desirably at 0.01% or

more, and a surfactant, used to polish silicon oxide, and says Fang can be used to polish silicon dioxide at high rate. The Examiner used Moeggenborg to supply an acetylenic alcohol comprising at least two hydroxyl substituents. Applicants respectfully traverse.

With respect to claim 19: Claim 19 recites a composition comprising a) an abrasive; b) a fluoride salt; and c) between 0.005% and 0.03% of an acetylenic alcohol comprising at least two hydroxyl substituents, and polishing a dielectric at a high rate.

Fang is not particularly directed toward a composition to polish dielectrics. Fang discloses a composition that is essentially without any bounds. The Fang composition includes

1) any carrier which includes but is not limited to water,

2) any suitable concentration but desireably about 0.1 wt. % or more (e.g., about 0.1-40 wt. %) **of any suitable solids including any suitable abrasive so long as some of the abrasive is fumed**,

3) **any amount** but preferably 0.01-20 wt. % **of any suitable chemical accelerator to improve the planarization or polishing of a substrate** and which can include, for example, oxidizers, chelating or complexing agents, catalysts, nitrogen-containing compounds including but not limited to amines, secondary amines, tertiary amines, quartenary amines, etheramines, hydroxylated amines, amino alcohols, amino ether alcohols, amino acids (e.g., glycine, alanine, iminodiacetic acid, valine, leucine, isoleucine, serine, and/or threonine), oligomeric amines, oligomeric imines, oligomeric amides, oligomeric imides, polymeric amines, polymeric imines, polymeric amides, and polymeric imides, sulfur-containing compounds, sulfates, poly-alcohols, halides including fluorides, chlorides, bromides, and iodides (are there any others?), oxidized halides, perboric acid, perborates, percarbonates, nitrates, persulfates, peroxides, peroxyacids, permanganates, chromates, cerium compounds, ferricyanides, oxidizing metal salts, oxidizing metal complexes, nonmetallic oxidizing acids, ammonium salts, phosphonium salts, trioxides, phosphates, and phosphonates;

and also 4) surfactants, polymeric stabilizers or other surface active dispersing agents, pH adjusters, regulators, or buffers, cationic surfactants, anionic surfactants, nonionic surfactants, amphoteric surfactants, fluorinated surfactants, **at any pH suitable for its intended end-use** but desirably has a pH of about 2-12. Applicant

would be pressed to name any chemical or compound which would definitely not be included in the "composition" of Fang!

The examiner noted that Fang said the "composition" was useful for polishing silicon dioxide at high rate. Fang also states his "composition" is useful to polish memory or rigid disks, metals, noble metals, ILD layers, semiconductors, micro-electro-mechanical systems, ferroelectrics, magnetic heads, polymeric films, and low and high dielectric constant films in the manufacture of integrated circuits and semiconductors. In short, fang's "composition" can polish substantially everything. Applicant would be pressed to name any electronic substrate not included in the above description. Fang further states "the composition of the present invention exhibits desirable planarization efficiency, uniformity, removal rate, and low defectivity during the polishing and planarization of substrates." That is, Fang's "composition" containing any carrier, any solid in any amount, any polishing accelerator in any amount, and any surfactant and/or polymers can be used to polish anything material related to metals or electronics and further does so with desirable planarization efficiency, uniformity, removal rate, and low defectivity.

Fang discloses high rate polishing on a variety of substrates, and "relatively high rate" polishing on silicon dioxide. Fang discloses a number of abrasives, including silica, ceria, alumina, ... Fang discloses a number of chemical accelerators, including fluorides among dozens of others. Fang discloses the genus of surfactants and every major subgroup of surfactants. Fang does NOT disclose, however, a composition containing silica which might polish a dielectric at a high rate. Fang does not disclose the surfactant recited in claim 19, nor the range of concentration therefore. One of ordinary skill in the art, given Fangs disclosure, could run hundreds of thousands of combinations of Fang with the various surfactants disclosed in the industry before possibly happening on the combination disclosed in claim 19. Such a possibility of running hundreds of thousands of tests with the thousands of surfactants clearly can not be shown to make the method of claim 19 obvious. Only by hindsight cherry-picking from the disclosures can the method of claim 19 be said to be obvious.

The Examiner uses hindsight to select fluorides from the hundreds chemical accelerants and with respect to claim 22 (which recites 0.004% fluorides) relies on the

Fang's disclosure of any amount of any chemical accelerator, as the minimum amount mentioned by Fang was 0.01%. The Examiner relies on Fang's disclosure of nonionic surfactants. But Fang does not disclose the acetylenic polyol recited in claim 19, nor does Fang disclose disclose using any surfactantl in an amount between 0.005% and 0.03%. The Examiner combines Fang with Moeggenborg to get the acetylenic polyol. The recited acetylenic diol is used by Moeggenborg in comparative Example 4 at Table 4 in column 12, where it was shown that the diol had little effect on silica removal rates but had a large negative effect (21 to 72% reduction) on carbon-doped oxide removal rates. And Examiner is taking this surfactant that Moeggenborg shows has a negative effect on dielectric rates, and is adding it to the "composition" of Fang containing essentially anything and which is good for polishing substantially anything at desireable rates, to obtain Applicants invention of a polishing composition useful for polishing oxide at a high rate. Regarding the very narrow claimed range in applicant's claim 19, the Examiner on page 10 wrote "one skilled in the art would have appreciated the amount need(ed) to optimize the slurry in terms of wettability, said amount being conventional in the art, as is shown by the second reference.

Moeggenborg in paragraph [0020] teaches:

> The polishing system typically comprises about 0.002 wt. % or more amphiphilic nonionic surfactant .... Preferably, the polishing system comprises about 0.005 wt. % to about 1.0 wt. % ... amphiphilic nonionic surfactant .... The amount of amphiphilic nonionic surfactant in part depends on the type of surfactant.

Of course, said amphiphilic nonionic surfactant is not believed to encompass the acetylenic diol. Further, the very limited compositional range recited in claim 19 does not optimize wettability, but rather optimizes the property of providing low defectivity. The Examiner further relies on the disclosure of any suitable amount of any chemical accelerant to obviate claim 22 as the minimum recited in Fang was 2.5 times the amount recited in claim 22.

Claim 19 recites a high dielectric material removal rate. Fang states "The composition of the present invention is capable of planarizing or polishing a substrate at a relatively high rate, e.g., removing the silicon dioxide layer from a layered substrate at a relatively high rate." Unfortunately, Fang provides no evidence of what he considers to be a "relatively high rate." Fang at column 2 lines 23 -32 says:

> The present invention provides a composition comprising (a) a liquid carrier, (b) a chemical accelerator, and (c) solids comprising about 5-90 wt. % of fumed metal oxide and about 10-95 wt. % of abrasive particles, wherein about 90% or more of the abrasive particles (by number) have a particle size no greater than 100 nm. The composition is useful in planarizing or polishing a surface. The present invention allows for a high polishing efficiency, uniformity, and removal rate of a surface with minimal defectivity, such as field loss of underlying structures and topography.

That is, Fang claims to polish everything at a high rate. Fang had 44 examples of polishing – 39 polishing nickel alloy and 5 polishing tungsten. No examples showed any polishing of any dielectric, and no other text suggested any dielectric polishing rate whatsoever. The highest polishing rates disclosed in Fang is 2735 angstroms of tungsten per minute and 2314 angstroms of nickel phosphor per minute. These must be the high rates mentioned by Fang. The compositions of Fang allegedly polish silicon dioxide at a "relatively high rate," which one of ordinary skill in the art would believe is somewhat less than a "high rate," and is therefore somewhat less than the rates at which the metals were removed. Applicants therefore urge that the "high rate" mentioned with absolutely no support does not make obvious the high rate required by claim 19.

So to summarize, the Examiner is combining Fang which teaches a polishing slurry having possibly most chemicals and compounds know to man disclosed, ether expressly or in large classes and includes every class of surfactants, where Fang says the composition provides a high rate for substantially every substrate used in microelectronics including silicon dioxide, with Moeggenborg who used the recited acetylenic diol in a comparative example which shows the compound to have a negative effect on polishing rate, to obviate claim 1 reciting a high polishing rate. Applicant believes that this is the clearest case of hindsight reconstruction Applicant has ever encountered, and further believes a prima facie case against claim 19 can not be maintained. Applicants request reconsideration and withdrawal of this rejection.

With respect to claims 21 and 34: Claim 21, as amended, recites a removal rate of silicon oxide (not silicon dioxide) of at least 3983 angstroms per minute. Claim 34 is similar in scope but more fully defines the silicon oxide. Fang states "The composition of the present invention is capable of planarizing or polishing a substrate at a relatively high rate, e.g., removing the silicon dioxide layer from a layered substrate at a relatively

high rate." Fang does not suggest his composition will remove silicon oxide at a high rate. Indeed, Fang states his composition will remove silicon dioxide at a "relatively high rate." Fang provides no evidence of what he considers to be a "relatively high rate." Fang at column 2 lines 23 -32 says:

> The present invention provides a composition comprising (a) a liquid carrier, (b) a chemical accelerator, and (c) solids comprising about 5-90 wt. % of fumed metal oxide and about 10-95 wt. % of abrasive particles, wherein about 90% or more of the abrasive particles (by number) have a particle size no greater than 100 nm. The composition is useful in planarizing or polishing a surface. The present invention allows for a high polishing efficiency, uniformity, and removal rate of a surface with minimal defectivity, such as field loss of underlying structures and topography.

That is, Fang claims to polish everything at a high removal rate. Fang had 44 examples of polishing – 39 polishing nickel alloy and 5 polishing tungsten. No examples showed any polishing of any dielectric, and no other text suggested any dielectric polishing rate whatsoever. The highest polishing rates disclosed in Fang is 2735 angstroms of tungsten per minute and 2314 angstroms of nickel phosphor per minute. These must be the "high removal rates" mentioned by Fang. However, the compositions of Fang allegedly polish silicon dioxide at a "relatively high rate," which one of ordinary skill in the art would believe is somewhat less than a "high rate," and is therefore somewhat less than the maximum rates at which the metals were removed. The maximum rates at which metals were removed in Fang was 2735 angstroms per minute. Claim 21 requires a silicon oxide removal rate of 3983 angstroms per minute. Moeggenborg does teach polishing an oxide. The highest silicon oxide rate disclosed in Moeggenborg is ~1200 angstroms per minute. Both Fang and Moeggenburg are well below the 3983 angstroms per minute recited in claim 21. Nothing in the text suggests that the compositions of Moeggenborg nor Fang could approach this silicon oxide removal rate. This combination of references therefore can not make obvious claim 21. Applicants request reconsideration and withdrawal of this rejection.

With respect to claim 22: Claim 22 recites the fluoride salt is present in an amount of about 0.004%. Moeggenborg does not teach use of fluoride. Fang teaches any amount but preferably 0.01-20 wt. % of any suitable chemical accelerator to improve the planarization or polishing of a substrate. One of the hundreds of chemical accelerators

Fang discloses is fluorides. Applicants maintain that the disclosure of fang does not reasonably teach one of ordinary skill in the art to employ a fluoride at concentration of about 0.004%. This combination of references therefore can not make obvious claim 22. Applicants request reconsideration and withdrawal of this rejection.

With respect to claims 30 and 39: Claim 30 recites that the abrasive is colloidal silica. Claim 39 recites that the abrasive consists essentially of colloidal silica. The ONLY definitive thing that Fang requires in his composition is that a portion of his abrasive be fumed. The combination of the colloidal and fumed abrasive providing increased substrate removal rates is central to Fang. Moeggenburg uses colloidal silica only, but can not approach the high silicon oxide removal rate. This combination of references therefore can not make obvious claim 30. Applicants request reconsideration and withdrawal of this rejection.

With respect to claim 32 (now claim 40, as amended): Claim 40 recites a composition consisting essentially of) a silica abrasive; b) a fluoride salt; c) an acetylenic alcohol comprising at least two hydroxyl substituents; and d) water. Fang in the abstract states "The composition comprises a liquid carrier, a chemical accelerator, and solids comprising about 5-90 wt. % of fumed metal oxide, and about 10-95 wt. % of abrasive particles." Fang discloses a number of abrasives, including silica, ceria, alumina, ... Fang discloses a number of chemical accelerators, including fluorides among dozens of others. Fang discloses the genus of surfactants and every major subgroup of surfactants. Fang does NOT disclose, however, a composition containing water, silica, fluoride, and the particular surfactant recited in claim 40. One of ordinary skill in the art, given Fangs disclosure, could run hundreds of thousands of combinations of Fang with the various surfactants disclosed in the industry before possibly happening on the combination disclosed in claim 40. Such a possibility of running hundreds of thousands of tests with the thousands of surfactants known in the art clearly can not be shown to make the method of claim 40 obvious. Moeggenborg in Example 4 a composition having silica, an acetylenic alcohol comprising at least two hydroxyl substituents, and benzotriazole at pH of 8. Only by hindsight cherry-picking from the disclosures can the method of claim 40 be said to be obvious. This combination of references therefore can not make obvious claim 30. Applicants request reconsideration and withdrawal of this rejection.

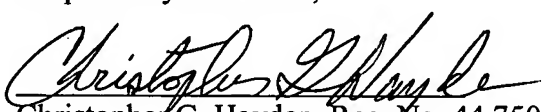
With respect to claims 36, 38, 46 and 47: Claims 36, 38, 46 and 47 recite defect parameters that are not taught or suggested by the combinations of art. Claim 36 recites a method where a property of the polishing composition is that when used to polish an oxide formed from plasma-enhanced deposition of tetraethoxy silane then after polishing a defect count measured by laser beam scattering at 0.13 microns resolution of 134 or less defects per wafer. Claim 38 recites a method wherein the dielectric material is an oxide formed from plasma-enhanced deposition of tetraethoxy silane , and after polishing and washing the wafer in a 1% HF solution a defect count measured by laser beam scattering at 0.13 microns resolution is 1632 or less defects per wafer. Claim 46 recites a method wherein the dielectric material is an oxide formed from plasma-enhanced deposition of tetraethoxy silane , and after polishing and washing the wafer in a 1% HF solution a defect count measured by laser beam scattering at 0.13 microns resolution is 1632 or less defects per wafer. Finally, claim 47 recites a method of polishing the dielectric silica oxide at rate of at least 3983 angstroms per minute, wherein after polishing if the wafer is rinsed for 2 minutes in a 1% HF solution a defect count after rinsing as measured by laser beam scattering at 0.13 microns resolution is 1632 or less defects per wafer. These claims are all supported by the examples. No such parameters are taught or suggested in any of the art cited by the Examiner.

SUMMARY

Applicants believe that all claims currently in prosecution are in condition for allowance over the cited art and respectfully request reconsideration and issuance of a Notice of Allowance. Should the Examiner have any further issues, the courtesy of a telephone call to the undersigned Chris Hayden at 703 837 0999 is requested. A request for a one month extension of time and fee therefore accompanies this Amendment. A fee of $350 is believed due for the added claims. Please charge the required fees to Hayden Stone PLLC Deposit Account No. 50-3975.

Respectfully submitted,

July 30, 2007



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